

Ringling and ornithological exploration in north-east Bangladesh wetlands

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Weights and biometric information are presented for 1,582 birds of 66 species ringed during four joint Bangladesh bird club–The Wetland Trust expeditions to three wetland Important Bird Areas in north-east Bangladesh between March 2011 and March 2013. Comprehensive checklists of bird species recorded at each site, Hail Haor (including Baikka Beel), Pashua Haor and Tanguar Haor, are appended. The species caught and ringed included seven that were additions to the country's avifauna: Chestnut-crowned Bush Warbler *Cettia major*, Aberrant Bush Warbler *C. flavolivacea*, Grey-sided Bush Warbler *C. brunnifrons*, David's Bush Warbler *Bradypterus davidi*, Large-billed Reed Warbler *Acrocephalus orinus*, Oriental Reed Warbler *A. orientalis* and Sykes's Warbler *Iduna rama*. The 11 Firethroats *Luscinia pectardens* caught and ringed suggest that this species is an annual winter visitor to the north-east of South Asia. These findings underscore the conservation importance of these major wetlands, all of which remain threatened by human exploitation. Only Baikka Beel and Tanguar Haor receive a measure of formal protection. Extending protection to reed, scrub and swamp forest habitats in all haors, especially Pashua Haor, which remains completely unprotected, is an urgent priority.

INTRODUCTION

This paper reports the results of four ringling expeditions to major wetlands in north-east Bangladesh between March 2011 and March 2013, organised through collaboration between Bangladesh bird club (Bbc) and the Wetland Trust, UK. The objectives were to develop ringling and identification skills of local ornithologists, to facilitate future ecological research in Bangladesh and to use ringling to help survey key wetland sites and gather information relevant to their conservation. Mist-netting in particular offered opportunities to detect and identify less conspicuous and lesser-known species, including some of global conservation concern, and to collect information on their ecology and annual cycles. The ringling trainers were: Nick Dymond (2011 & 2012), Ian Hunter (2013), Bill Jones (2012 & 2013), Andrew Pierce (2011–2013), Philip Round (2011–2013), and Kevin Thornton (2012). The participants from Bbc (who included two officers of Bangladesh Forest Department and one field staff of IUCN, Bangladesh) were: A. B. M. Sarower Alom, Allama Shibli Sadik, Enam Ul Haque, Fatema tuz Zohora Mila, Israt Jahan, Majeda Haq, M. A. Mohit, Mohammad Foysal, Mohammad Tarik Kabir, Tania Khan, Omar Shahadat Uzzal, Samiul Mohsanin, Sayam U. Chowdhury and Zenifer Azmeri. In February–March 2013 we were joined by Ugyen Tenzin and Kencho Gyltshen, officers from Royal Bhutanese Department of Forests.

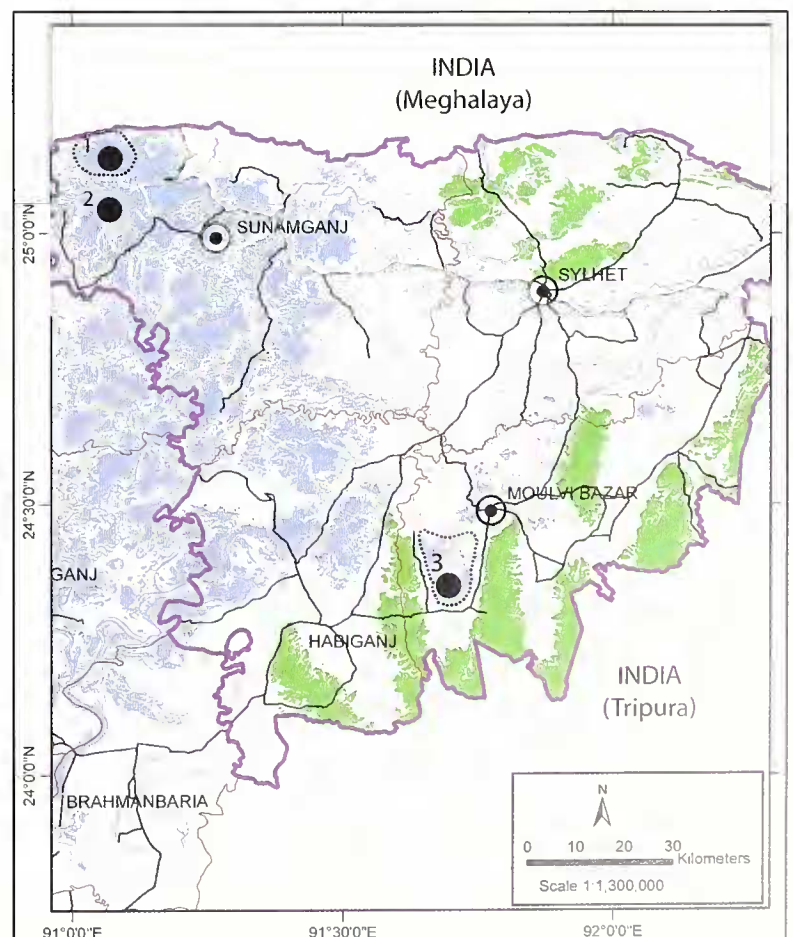
STUDY AREA AND METHODS

The work was carried out in the floodplain of Sylhet division, north-east Bangladesh. About two-thirds of the country lies in the floodplains of the major river systems, and at least one-third of the land area is entirely inundated each year during the monsoon season. Large seasonally flooded wetlands in the north-east of the country are known as haors. These depressions, bounded by rivers, often with natural levees raised with low embankments, flood for 6–7 months during the monsoon. In the dry season, roughly November to March, a typical haor comprises paddyfields growing a single wet rice crop and a grassy floodplain on which cattle are grazed, surrounding permanent waterbodies known as beels. Swamp-forest dominated by the trees Korocho *Millettia pinnata* and Hijal *Barringtonia acutangula* was formerly a major component of the vegetation but has progressively diminished due to intensive human use/exploitation; stands of *Phragmites karka* and other tall wetland grasses were also extensive in some areas. In the wet season extensive

flooding causes the beels to expand and the individual waterbodies combine as a huge sheet of water which may completely submerge much of the vegetation.

The Sylhet basin has a subtropical monsoon climate, with average maximum temperatures of 30–33°C and minimum temperatures of 21–25°C in the summer monsoon season; and maximum 25–29°C, minimum 8–17°C during the winter dry season. The average rainfall is 4,000 mm of which about 80% falls between April and October (Khan 1997). The wetland habitats have for generations been exploited by the human population, particularly during the dry season, when fish and aquatic plants are harvested from the beels and floodplains as they dry up. Besides

Figure 1. Map showing location of study sites (bold black dots): (1) Tanguar Haor ringling site; (2) Pashua Haor ringling site; (3) Hail Haor and Baikka Beel ringling site. Green areas indicate forest and plantations; blue indicate more or less permanently inundated areas.



growing a single crop of winter rice on land surrounding the beels, reeds and swamp trees are cut for construction and fuel, while cattle and buffaloes are grazed on lands too dry for rice production. In addition to resident communities who live year-round in villages located on raised mounds, seasonal migrants camp in the haors for fishing and livestock-rearing during the dry season.

All three sites visited—Hail Haor (incorporating Baikka Beel), Tanguar Haor and Pashua Haor—are listed as Important Bird Areas (BirdLife International 2004) and the two first named have been afforded some form of protection for all or part of their area.

Baikka Beel 24.350°N 91.700°E

This 170 ha site lies at the south-east edge of the 3,000–12,000 ha (wet season area) Hail Haor, Moulvi Bazar district, about 6 km north-west of Srimangal town. It is about 10 km from the higher ground to the east which extends south to the border with Tripura state, India.

The government declared Baikka Beel a permanent wetland sanctuary in 2003, since when it has become a major conservation project instigated by a local community organisation, and supported up to 2008 by the Management of Aquatic Ecosystem through Community Husbandry (MACH) project, funded by USAID, and then by two further projects also funded by USAID. This is part of a wider effort to establish co-management and sustainable use of Hail Haor. These efforts have successfully reversed degradation, rehabilitated the wetland and replanted the swamp forest that had previously disappeared.

The study area was on the eastern edge of the open beels and marshes of the sanctuary and comprised a narrow strip of native *Barringtonia* and *Millettia* swamp-forest trees planted during 2003–2005. On the east side, it was bounded by a canal separating the reserve from extensive areas of irrigated rice-paddy, whilst on the west the boundary was a narrow belt of woody *Ipomoea fistulosa*, parallel with the lakeshore. It was separated from the water's edge by a 50–100 m-wide expanse of marshy grassland.

Most mist-nets were placed in rides cut in the *Ipomoea*, perpendicular to the long axis of the vegetation, and in the swamp-forest plantation, below the 5 m high canopy. The area in which nets were set was about 5 ha.

Pashua Haor 25.050°N 91.100°E

Pashua (also known as Gurmar) Haor is a 4,000–5,000 ha area, bounded by rivers with low embankments built along the natural levees. Most of the beels have now been drained for dry-season agriculture but were formerly managed to retain water for fish in the dry season. It was previously of international importance for wildfowl—for example, in 1993 the haor held an estimated 250,000 wintering waterbirds. Pashua Haor currently lacks protected status, and fishing rights in the beels are leased out by the district administration, but it has recently (2013) been proposed for conservation-oriented collaborative management that would follow the similar approaches already employed in Hail Haor and Baikka Beel.

The ringing site was in and around the margins of an area of *Millettia* scrub-woodland that extended to within 150 m of the Baulai River. Adjacent areas consisted of open grassy marsh. Nets were positioned both in and around the margins of the scrub-woodland and in areas of lower scrub, herbage and emergent aquatic plants. The area in which nets were set was about 10–15 ha. An overnight camp was set up roughly 2 km away at a fishing camp.

Tanguar Haor 25.083°N 91.117°E

Tanguar Haor is roughly 10,000 ha in area and lies about 30 km west-north-west of Sunamganj town. Parts of the northern edge of the haor are only 2–3 km south of the Garo Hills, Meghalaya state, India, which rise to over 1,500 m. Large areas are dominated by

reeds, other wetland grasses and emergent herbage, although some important habitat has been cleared—for example, a 2–5 ha area of Giant Cane *Arundo donax* which formerly supported species such as White-tailed Rubythroat *Luscinia pectoralis* and almost certainly Firethroat *L. pectardens* until cleared between 1997 and 2004.

Tanguar Haor regularly supports over 100,000 waterbirds; designated as an Ecologically Critical Area by the government in 1999, it was declared a Ramsar Site in 2000 (Alam *et al.* 2012). The IUCN Bangladesh Country Programme is in the process of implementing a community-based sustainable management project at the site, funded by the Swiss Agency for Development and Assistance.

The ringing camp was in a small *Millettia* and *Barringtonia* plantation near Golabari village, Lessmara Beel, by the Patnai River. The study area was mainly scrub and low herbage, with small areas of reeds, and the area in which nets were regularly set was about 15 ha. Visits were also made by boat to a reed-covered island, where nets were set on some days.

METHODS

ND, EUH and PMT made a preliminary visit to the three sites between 14 and 18 January 2010, as part of an annual midwinter waterbird survey, in order to investigate the logistics for future work. No nets were erected, although field observations of birds were made. Ringing activities were conducted on four visits between March 2011 and March 2013. Baikka Beel was visited in all three winter seasons, 5–10 March 2011, 2–8 December 2011 and 24–27 February 2013 (17 days), Tanguar was visited in two winters, 19–26 February 2012 and 3–8 March 2013 (14 days), and Pashua between 10–19 February 2012 (10 days).

Birds were caught in mist-nets. Usually 6–12 nets (small-mesh, four-panel, 12 m or 18 m nets) were used on each site. These were located opportunistically, most often in emergent waterside vegetation and scrub. Occasionally at Baikka Beel and Tanguar Haor a few nets were positioned beneath plantations of swamp-forest trees where, however, they were too low in the vegetation column to sample birds effectively in the 4–6 m canopy. Nets were usually fixed in position for at least 2–3 days and moved to a new site when numbers of birds caught declined, as birds became accustomed to them. Nets were usually open from dawn to late morning, when they were furled. From time to time, some nets were opened in late afternoon. One or two local men were hired as nightwatchmen to guard the furled nets overnight at Pashua and Tanguar, the less secure sites.

Because development of the capacity of local ornithologists was a major aim of the programme, most of the commoner species were usually processed by trainees, under the supervision of experienced ringers. Key measurements such as wing length, bill length and tarsus length were usually checked by the trainer(s). Detailed wing formulae, where necessary, were recorded by experienced ringers.

Biometric data, particularly for warblers, are reported here as in some cases these may constitute the largest published datasets from live-trapped birds. In discussion of wing formula, primaries are numbered with the short, outermost primary as p1 and innermost p10 for convenience. All bill measurements were to the base of the skull. Wing lengths were maximum chord, and tarsus length was measured using the 'bent-toe' method of Svensson (1992).

RESULTS

The avifauna of all three sites, particularly Hail Haor, was already quite well known before our mist-netting expeditions, observations having been collected annually in recent years during the Asian

Midwinter Waterbird Census and other visits. Up to February 2013 a total of 217 resident and migrant species have been recorded from the entire area of Hail Haor, 11 of which were added at Baikka Beel by this study. Within the small area of Baikka Beel 169 species have now been recorded. This compares with 161 species—including 12 added in this study—for Pashua Haor and 176—23 added in this study—for Tanguar Haor (Appendix 1).

A total of 1,582 birds of 66 species were ringed at the three sites during the three seasons (Appendix 2). The resident avifauna of these sites was relatively depauperate, and the absence or scarcity of some species was assumed to be related to the hydrological regime. Prolonged, several metres-deep inundation of much of the area during the monsoon season presumably results in the absence of many sedentary species. Even the nationally abundant Red-vented Bulbul *Pycnonotus cafer* was scarce. Striated Babbler *Turdoides earlei* and Rufous-necked Laughingthrush *Garrulax ruficollis* were encountered only at Baikka Beel and its immediate surroundings, which are close to wooded uplands, allowing colonisation by these species. Striated Babbler has been recorded at Baikka Beel since winter 2004–2005 (PMT pers. obs.). Both these species may also occur in parts of Tanguar Haor close to the Meghalaya hills not surveyed during the project.

Species accounts

Greylag Goose *Anser anser*

Scarce winter visitor. A flock of 32 was at Tanguar Haor on 21 February 2012. Five in flight at Baikka Beel on 27 February 2013 constituted the second record for the site.

Bar-headed Goose *Anser indicus*

Winter visitor mostly in coastal areas. Seven in flight over Tanguar Haor on 5 March 2013 provided the first record for the site.

Black Stork *Ciconia nigra*

Rare but regular winter visitor mainly to sandbanks in the main rivers (Siddiqui *et al.* 2008). One in flight over Pashua Haor on 13 February 2012 was the first record for any of the haors.

Black-headed Ibis *Threskiornis melanocephalus*

Winter visitor, more numerous on the coast. Seven were at Baikka Beel, on 26 February 2013, where it is a regular winter visitor (highest count 24).

Glossy Ibis *Plegadis falcinellus*

At Baikka Beel a maximum of 30 on 26 February 2013, following the first site record of 25 on 11–12 February 2013 (PMT). At Tanguar, 26 on 6 March 2013 was also the highest site count. Thompson *et al.* (2014) provide a comprehensive review of national records of this species. It is premature to say whether the February–March 2013 influx is indicative of a longer-term increase in birds wintering in Bangladesh. The species has widened its Asian range in recent years, having colonised Thailand, where it now breeds (PDR pers. obs.).

Raptors

The area is rich in raptors with at least 27 species recorded (Appendix 1), of which about half were seen during the surveys. Black Kites *Milvus migrans*, Brahminy Kites *Haliastur indus* and harriers *Circus* spp. were moderately common. Definitive adult males of both Western Marsh Harrier *C. aeruginosus* and Eastern Marsh Harrier *C. spilonotus*—listed as rare for South Asia (Rasmussen & Anderton 2012)—were seen.

The Vulnerable Pallas's Fish Eagle *Haliaeetus leucorhynchus* was present at all sites, with 12 immature individuals in close proximity at Baikka Beel in February 2011 (PMT pers. obs.). Active nests

were seen on a telephone tower by the Surma River at Gojaria Bazar, in *Millettia* trees near Joyshree Bazar on the Baolai River, and in a *Crataeva nurvala* tree at Golabari village, Tanguar Haor. The species is already well known at the ringing sites, although numbers were fewer than reported in BirdLife International (2001), suggesting ongoing population decline. Although there is no estimate of the national or regional population it remains of international conservation importance.

A first-winter Shikra *Accipiter badius* was caught and ringed at Pashua Haor (Appendix 2).

Northern Lapwing *Vanellus vanellus*

Regular rare winter visitor which may be increasing (Thompson *et al.* 2014). A single was present at Tanguar Haor on 22 February 2012.

Pied Cuckoo *Clamator jacobinus*

One in flight at Baikka Beel on 24 February 2013 was unusual—the species is typically a summer (wet-season) visitor to Bangladesh (Siddiqui *et al.* 2008).

Common Hawk Cuckoo *Hierococcyx varius*

Although a common resident in village groves and open woodland in Bangladesh, one/two birds seen daily in swamp trees at our camp site at Tanguar Haor in February 2012 were the first recorded for the site.

Lesser Coucal *Centropus bengalensis*

Mainly found in scrub and tea estates in east Bangladesh (Siddiqui *et al.* 2008) but may be widespread where areas of marshy scrub and tall grass remain in the haors. A single caught and ringed at Tanguar Haor was the first record for the site.

Brown Hawk Owl *Ninox scutulata*

Widespread in Bangladesh. A single caught at Baikka Beel on 5 December 2012 appeared to be the first record for the site; it showed characters of *N. s. burmanica*, the race listed for Bangladesh and north-east India (Ali & Ripley 1983). A decomposed bird was found suspended in a fishing net at Baikka Beel on 25 February 2013.

Eurasian Wryneck *Jynx torquilla*

Widespread winter visitor to bushy areas and open wooded habitat. Four birds trapped—two adults, one first-year and one not aged. One of two Baikka Beel birds retrapped three days after ringing in December 2012 showed a weight loss of 0.5 g.

Fulvous-breasted Woodpecker *Dendrocopos macei*

Common throughout the country in village groves and open woodland; even found in wooded areas in inner-city Dhaka. A single male was caught in planted swamp-forest at Baikka Beel on 6 March 2011, where it is a recent colonist.

Grey-backed Shrike *Lanius tephronotus*

Widespread but scarce winter visitor (Siddiqui *et al.* 2008). A single trapped and ringed at Baikka Beel on 24 February 2013 was the fifth site record.

Black-hooded Oriole *Oriolus xanthornus*

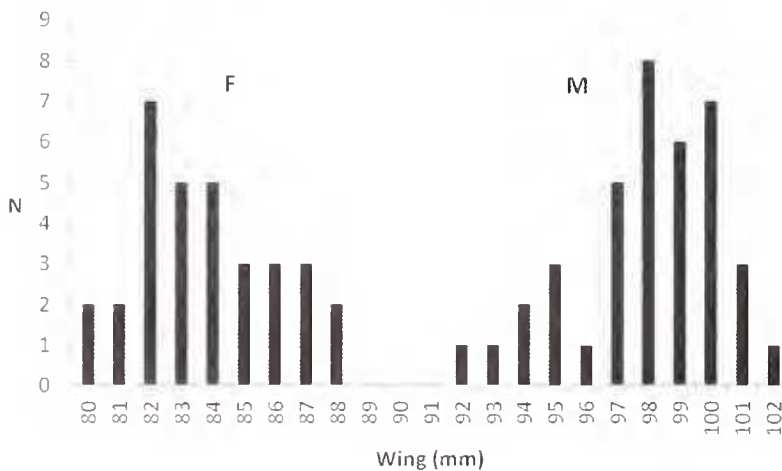
Five birds trapped, three at Pashua (including one retrieved from an itinerant fisherman who had caught it in a fish-net) and two at Tanguar; also at Baikka Beel but none caught there. In South-East Asia, this species is largely associated with extensively wooded areas, both open-canopy dry dipterocarp woodland and closed-canopy taller forest, although also found in swamp-forest and secondary growth; but in Bangladesh it is widespread in villages and all

wooded areas, wandering into more open places, including this seasonally almost totally inundated landscape with minimal wooded cover—mostly low-stature trees on embankments.

Striated Grassbird *Megalurus palustris*

One of the commonest resident birds at all sites, generally found at the edge of reed and *Ipomoea* beds where there are isolated clumps of vegetation in the grassy floodplain. Marked sexual dimorphism in body size was evident, the birds' wing length showing a near-perfect bimodal distribution, with presumed males measuring 92–102 mm and females 80–88 mm (Figure 2, Appendix 2). Males also averaged nearly half as heavy again as females. Breeding had started by late February and a nest with eggs was observed at Baikka Beel on 25 February 2013. Two males and a female ringed at Baikka Beel in December 2011 were recaptured in late February 2013.

Figure 2. Wing lengths of Striated Grassbird *Megalurus palustris*.



Chestnut-crowned Bush Warbler *Cettia major*

One caught in scrub at Pashua Haor on 16 February 2012 was the first country record. Wing length 64 mm (Appendix 2), bill 14.3 mm, tarsus 23.0 mm; it had lost its tail. The race was undetermined. Two are recognised: nominate *major* Himalayas to south-west China and *vafra* Meghalaya and north-east India (Kennerley & Pearson 2010).

Aberrant Bush Warbler *Cettia flavolivacea*

Six birds trapped and ringed, five at Pashua Haor during 12–19 February 2012 and one at Tanguar Haor on 8 March 2013 (Table 1). All were caught in very low (<1 m high) scrub. Based on the strongly yellow-suffused supercilium and underparts, all could be assigned to the western group of races (*C.f. flavolivacea*, *C.f. stresemanni* and *C.f. weberi*) though not more precisely. These are the first national records: Rashid (1967) listed this species but there are no previous documented records. These were presumably migrants from the Meghalaya hills, and the capture sites (altitude about 20 m), change the reported lowest altitude (250 m) significantly (Rasmussen & Anderton 2012).

Table 1. Biometrics (mm) of six Aberrant Bush Warblers *Cettia flavolivacea* caught in north-east Bangladesh.

	Mean s.d. mm	Range mm
Wing length	54.1 ± 1.80	52–56.6
Tail length	52.3 ± 2.50	49–55
Tail:wing ratio	0.97 ± 0.02	0.94–0.98
Tail graduation	12.7 ± 1.65	10.9–15.5
Bill	14.2 ± 0.15	14.0–14.4
Tarsus	22.9 ± 0.73	22.2–23.4

Grey-sided Bush Warbler *Cettia brunnifrons*

One caught at the edge of a reedbed on an island at Tanguar Haor on 24 February 2012 was the first country record. Although listed by Rashid (1967), there are no previous documented records, the nearest being from the Garo Hills, Meghalaya, which overlook the site (Rasmussen & Anderton 2012). Superficially similar to Chestnut-crowned Bush Warbler, it differed in its much smaller size (Appendix 2)—tail 47 mm, bill 11.8 mm, tarsus 18.2 mm—with proportionately longer tail (tail:wing ratio was close to unity). For comparison, tail:wing ratio for six *Cettia major*, caught and ringed in north Thailand, was 0.73–0.81 (AJP unpubl. data).

Plumage differences from *C. major* were the darker brown undertail-coverts, slightly greyer sides to the breast, and lack of a gingery suffusion on the anterior part of the whitish supercilium. The race was undetermined but was most likely either nominate *brunnifrons* (central Himalayas) or *umbratica* (north-east India and north Myanmar). The differences among the (three) races are said to be clinal (Kennerley & Pearson 2010).

Spotted Bush Warbler *Bradypterus thoracicus*

David's Bush Warbler *B. davidi*

These taxa are difficult to separate in the field and until the 1990s were considered to be conspecific until Round & Loskot (1995) examined the morphological differences between them and suggested that *B. davidi*, a long-range migrant, should be recognised as a separate species from *B. thoracicus*, which migrates over much shorter distances. Both taxa were present at all sites in similar numbers: 13 Spotted Bush Warblers and 12 David's Bush Warblers were ringed during the whole period. David's Bush Warbler was first detected in the field, being both seen and heard; the *dzzzzzzz* call of this species, which appears to derive from a low-intensity version of the song (Round & Loskot 1995), is diagnostic. Many (e.g. *chacking*) calls of *Bradypterus* and *Locustella* species are hard to distinguish and no diagnostic calls that could be definitely associated with Spotted Bush Warbler were detected during the period.

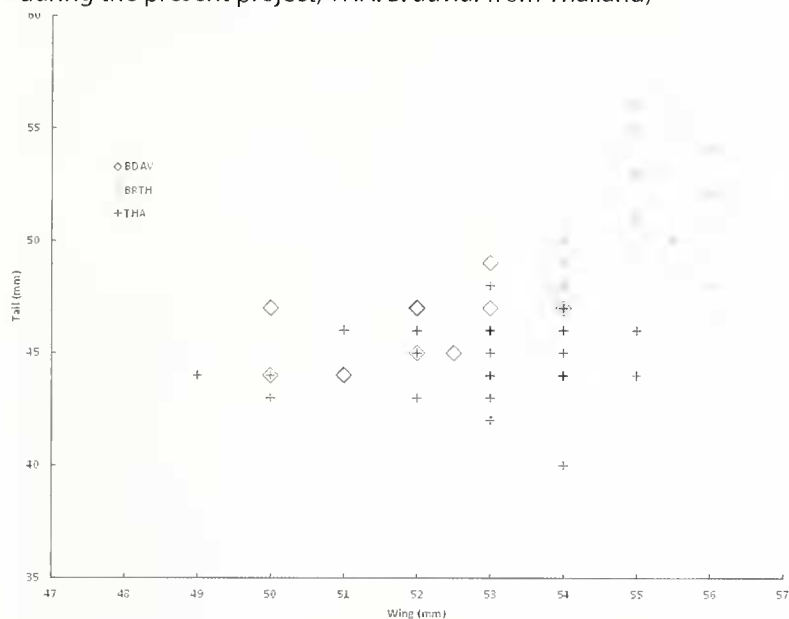
The mean wing length for *B. davidi* captured in Bangladesh was 51.9 ± 1.16 mm compared with 55.0 ± 0.78 mm for *B. thoracicus* (Table 2). Whilst Spotted Bush Warbler is the larger bird, David's, the longer-distance migrant, has a more pointed wing and the largest individuals of the latter overlap in wing length with Spotted. Spotted Bush Warbler is on average longer-tailed and a plot of wing against tail length (Figure 3) is sufficient to separate most individuals. Data on *B. davidi* from Thailand (where *B. thoracicus* is, as yet, unrecorded), held on file by AJP and PDR, are included in Figure 3. No *B. davidi* with tails of 50 mm or longer have yet been found.

Both species have sharply defined white edges to the undertail-coverts which contrast markedly with the dark brown bases to the feathers. The white edges are very narrow, usually only 1–2 mm broad, in *B. thoracicus* compared with much broader (3.5–5 mm) edges of *B. davidi*. Round & Baral (2013), in referring to this distinguishing feature, unknowingly overlooked its earlier mention in Alström *et al.* (2008). Additionally, whilst both species have strongly rounded tails, in which the longest undertail-coverts are longer than the shortest outermost tail feathers, the projection of the tail beyond the longest (central) undertail-coverts is much longer in *B. thoracicus*. Alström *et al.* (2008) gave a mean projection of 16.43 ± 1.73 mm for three *B. davidi* compared with 22.72 ± 3.25 mm for 12 *B. thoracicus*. This compares with respective ranges of 12.5–17.0 mm for six *B. davidi* from Bangladesh and Thailand combined, and 18.0–21.4 mm for three *B. thoracicus* in which this feature was measured (Table 2).

A Spotted Bush Warbler caught at Baikka Beel on 25 February 2013 was in the early stages of primary moult and was moulting the three innermost primaries (aggregate moult score 5) of both

Table 2. Wing and tail measurements (mm) of *Bradypterus* taxa caught in Bangladesh compared with sample of *B. davidi* from Thailand († data held on file by AJP and PDR).

	Wing	Tail	Tail projection	Tail:wing
<i>Bradypterus davidi</i> †(Thailand)	52.8 ± 1.51 (n=71; 48–55)	44.9 ± 1.64 (n=35; 40–48)	12.5–17.0 (n=5)	0.87 ± 0.015 (n=35; 0.83–0.91)
<i>Bradypterus davidi</i> (Bangladesh)	51.9 ± 1.316 (n=12; 50–54)	46.1 ± 1.62 (n=12; 44–49)	13.8 (n=1)	0.89 ± 0.027 (n=12; 0.86–0.94)
<i>Bradypterus thoracicus</i> (Bangladesh)	55.0 ± 0.78 (n=13; 54–56)	51.2 ± 2.70 (n=13; 48–56)	18.0–21.4 (n=3)	0.93 ± 0.045 (n=13; 0.86–1.02)

Figure 3. Graph of tail against wing length for Spotted Bush Warbler *Bradypterus thoracicus* and David's Bush Warbler *B. davidi* (BDAV: *B. davidi* trapped during present project; BRTH: *B. thoracicus* trapped during the present project; THA: *B. davidi* from Thailand)

wings. There appear to be no previously published data on moult in this species (Kennerley & Pearson 2010).

Although Round & Loskot (1995) identified a specimen collected by Whistler from northern West Bengal as *B. davidi*, Rasmussen & Anderton (2012) considered it was in too poor a condition to assign, and listed the taxon as hypothetical for South Asia. The same authors mention a 2012 sight record (J. Eaton *in litt.*) from north-east India. The first undoubted David's Bush Warblers documented for South Asia, were therefore two individuals caught at Baikka Beel on 4 December 2011. The 12 *B. davidi* caught during the present study, together with one caught and ringed at Koshi, Nepal (Round & Baral 2013), together with the 13 *B. thoracicus* caught during our study, reaffirm that both *B. davidi* and *B. thoracicus* may now be considered as localised, scarce, probably regular, winter visitors to lowlands in north-east South Asia. The latter was previously considered a rare winter visitor to Bangladesh, but observers did not then distinguish between the taxa in the field.

Lanceolated Warbler *Locustella lanceolata*

The only record was one seen at Pashua Haor on 15 January 2010 by ND, EUH, PT and J. Pender during the exploratory visit. This was only the fourth record—there being two previous records from Pashua Haor and one from Tanguar Haor (Thompson *et al.* 1993, Thompson & Johnson 2003). Lanceolated Warbler appears to be genuinely scarce at these sites. Although small, and sometimes apt either to pass unhindered through even small-mesh mist-nets, or avoid capture if the net is not set low enough, the fact that a number of David's Bush Warbler, of similar size and demeanour to Lanceolated Warbler, were caught would indicate genuine rarity of the latter species.

Pallas's Grasshopper Warbler *Locustella certhiola*

This species was present at all sites and 27 were trapped. Although plumage features and biometrics vary markedly among the five races usually recognised across the extensive north and central Asian

breeding range, all those caught had features consistent with race *L. c. rubescens*. Adults could usually be distinguished from first-winter birds by having two ages of primaries in which the outermost 2–4 had been replaced in a partial post-breeding moult. Pre-breeding moult had not started in any birds trapped up to the end of the survey period in mid-March.

Black-browed Reed Warbler *Acrocephalus bistrigiceps*

A total of 26 were trapped and ringed, two at Baikka Beel and 24 at Tanguar. The predominance of the species at Tanguar, and apparent absence from Pashua, was presumably due to the close association of this species with reeds and similar aquatic vegetation rather than scrub, where it occurs less frequently. Nevertheless a single was seen at Pashua Haor on 16 January 2010 by ND and PMT during the exploratory visit.

Paddyfield Warbler *Acrocephalus agricola*

A total of 143 were ringed, of which 130 were caught at Tanguar Haor, reflecting the preference of this species for reeds and sedges rather than scrub. Mean tarsus length: 22.0 ± 0.87 mm, range 18.7–24.9 (n = 126). Mean bill length: 15.4 ± 0.71 mm, range 13.0–17.3 mm (n = 131). Mean tail length: 56.5 ± 2.02 mm, range 52–63 mm (n = 140). The individual with a bill length of 17.3 mm, well above the expected upper limit for this species, was carefully measured by two independent observers who agreed on both bill length and the identification features of the bird concerned. It appeared to be an aberrant individual and was photographed for the record.

Blyth's Reed Warbler *Acrocephalus dumetorum*

The most frequent *Acrocephalus*, occurring at all sites; 286 ringed (Appendix 2). It fed in a wide range of habitats including scrub and swamp-forest plantations, frequently found in the low canopy of trees. One individual ringed at Tanguar Haor in February 2012 was recaptured there in March 2013. Tarsus length, mean 22.6 ± 0.75 mm (range: 20.7–25.0 mm, n = 233). Hindclaw length, mean 6.2 ± 0.42 mm (range: 5.1–7.3, n = 128). Bill length, mean 17.5 ± 0.66 mm (range: 15.1–19.3 mm, n = 272), was longer than recorded by Svensson (1992) and Svensson *et al.* (2008, 2010) but closer to Kennerley & Pearson (2010) who reported 17.2 mm (range 15.5–18.5 mm) for males and 17.0 mm (range 15.5–18.0 mm) for females. Mean tail length: 53.6 ± 1.89 mm, range 46–61 mm (n = 272).

Large-billed Reed Warbler *Acrocephalus orinus*

A single caught in *Ipomoea* at Baikka Beel on 6 December 2011 (Table 3) was identified primarily on the combination of its long bill and long hindclaw (Round *et al.* 2007, Svensson *et al.* 2008, 2010). Identification was confirmed in January 2014 through assay of cytochrome *b*. A second putative individual from Tanguar Haor on 25 February 2012—bill length 19.1 mm and hindclaw 7.0 mm,

Table 3. Details and biometrics (mm) of a Large-billed Reed Warbler *Acrocephalus orinus* netted in north-east Bangladesh, 6 December 2011.

Ring no.	wing	tail	bill length	bill width*	tarsus	hindclaw	p2	emarg.
A000031	62	55	21.0	4.5	25.0	7.4	=p7/p8	3,4(5)

(* measured at base of nostrils)

referred to as 'probable' (Haque *et al.* 2012)—proved on assay of cytochrome *b* to be a Blyth's Reed Warbler.

This is the first record from Bangladesh. Apart from north-west India, with four museum specimens dating from 1867 to 1933, taken in October, November and May (Svensson *et al.* 2008), the only other records from South Asia are unauthenticated, albeit highly probable, sight records of one or more from West Bengal (Kennerley & Pearson 2010). Given the difficulty of separating this species from Blyth's Reed Warbler, and that a straight line drawn on a Mercator projection map from north-west India to Pegu (now Bago), near Yangon, Myanmar, where there are two records from May 1879 and January 1880 (Svensson *et al.* 2008), would pass through Bangladesh, the occurrence of Large-billed Reed Warbler was not unexpected.

Oriental Reed Warbler *Acrocephalus orientalis*

Clamorous Reed Warbler *A. stentoreus*

In all, 19 Oriental Reed Warblers were trapped and ringed over the whole period, five at Baikka Beel and 14 at Tanguar Haor, compared with 69 Clamorous Reed Warblers at all three sites. The absence of Oriental Reed Warbler from Pashua Haor, where nets were mostly located in scrub woodland, was probably due to the scarcity of reeds and other short emergent non-woody waterside vegetation at that site. The Clamorous Reed Warblers were presumed to be race *A. s. brunnescens*, which breeds mainly in central Asia and also patchily in parts of South Asia (Rasmussen & Anderton 2012) although not at any of the present sites. Three Clamorous Reed Warblers ringed at Baikka Beel in March 2011 were recaptured in late February 2013 (one of them had been recaptured previously in December 2012). Another individual ringed at Tanguar Haor in February 2012 was recaptured there in March 2013.

Separation of these large reed warblers was based primarily on accepted wing formula criteria following Kennerley & Pearson (2010). In Oriental Reed Warbler, the second outermost primary, p2, was usually longer than p5, occasionally = p5 and only rarely < p5, whereas in Clamorous Reed Warbler p2 was always shorter than p5, occasionally = p6, or (rarely) shorter than p6. The notch on the inner web of p2 was usually longer in Clamorous Reed Warbler than in Oriental Reed Warbler, falling slightly below the tips of the secondaries, while Oriental Reed Warbler had a shorter notch, falling roughly opposite to, or outside, the tips of the secondaries although this feature was less easily judged. The bill length of Oriental Reed Warbler was shorter (mean length 23.6 ± 0.79 mm), compared with Clamorous Reed Warbler (mean length 25.3 ± 1.26 mm) (Table 4). Generally the shorter, weaker supercilium of Clamorous Reed Warbler was a helpful field character and adults usually showed a much warmer brown iris than seen in Oriental Reed Warbler.

Although these records of Oriental Reed Warbler may be regarded as the first confirmed records for Bangladesh, its presence had long been suspected here and in north-east India, based on sight records and photographs (Rasmussen & Anderton 2012). However, caution is needed because many Clamorous Reed Warblers examined showed buffy white tips to the outer rectrices, and some showed apparent vague breast streaking, both features usually suggested as aiding recognition of Oriental Reed Warbler.

Sykes's Warbler *Iduna rama*

One caught in a mixed stand of *Barringtonia/Millettia*-planted swamp-forest trees at Baikka Beel on 7 March 2011 was the first confirmed record for Bangladesh.

It was a small sandy-greyish, noticeably broad-billed warbler, with a white outer web, tip and distal part of the inner web of R6 and distal inner web only of R5. Its legs were pale fleshy-brown with dusker soles to the feet. Three scutes were visible on the tarsus. The lower mandible was pale, imperceptibly dusky towards the tip; and the upper mandible brownish slaty with a narrow pale cutting edge. The gape was bright yellow and the iris dark brown. The initial impression was that the bird somewhat resembled a Paddyfield Warbler due to its sandy-grey colour and the smallish bill (small for an *Acrocephalus* but too large and broad for a *Phylloscopus*). However, the tail was only slightly rounded (shortfall of outermost rectrix was 4 mm) and the undertail-coverts appeared somewhat short for an *Acrocephalus*. The white in the tail immediately suggested either Booted Warbler *I. caligata* or Sykes's Warbler *I. rama*.

The single most important diagnostic character was bill-width which, measured at the proximal edge of the nostrils, was 4.3 mm. This unequivocally indicated Sykes's Warbler—indeed, it is at the upper margin of the range of measurements for that species—with bill-width given as 3.6–4.3 mm compared with 3.3–3.8 mm for Booted Warbler (Kennerley & Pearson 2010). Additionally, the edges of the mandibles were straight laterally when viewed from above, whereas the bill of Booted Warbler is noticeably fine and concave-sided (Kennerley & Pearson 2010). Supporting features favouring Sykes's Warbler were the shortish second primary, a short primary projection with only five primary tips protruding beyond the tertials and bunched secondaries, the relatively long, sloping forecrown, the supercilium which was broad and most visible above the eye, compared with supercilium extending behind the eye in Booted Warbler, and the dark loreal spot rather than a loreal line. The tail was 48 mm, bill 14.4 mm and tarsus 19.6 mm. Wing length was 61 mm and weight 9.2 g (Appendix 2). The bird was silent on release.

Harvey (1990) lists Booted Warbler for Bangladesh, but does not list individual records and lacks documented records from two of the observers. Nor does his account distinguish between *Iduna caligata* and *I. rama*, then treated as conspecific. Siddiqui *et al.* (2008) merely repeat the account in Harvey (1990). Sykes's Warbler is listed by Rasmussen & Anderton (2012) as wintering in South Asia, east to Bihar and south to Sri Lanka, with Booted Warbler apparently extending to the extreme eastern edge of West Bengal, close to the border with Bangladesh.

Common Chiffchaff *Phylloscopus collybita*

A total of 16, all apparently race *tristis*, were trapped and ringed, mostly in reedbeds and low herbage at Tanguar Haor. Although treated as a rare winter visitor (Siddiqui *et al.* 2008), it is more frequently recorded from the north-east than from other parts of the country (PMT pers. obs.).

Dusky Warbler *Phylloscopus fuscatus*

The commonest migrant passerine encountered, recorded at all sites; 386 ringed. Wing length was bimodally distributed; the modal

Table 4. Biometrics of Oriental Reed Warbler *Acrocephalus orientalis* and Clamorous Reed Warbler *A. stentoreus*.

	Wing	Tail	Tail:wing ratio	Bill	Tarsus
<i>Acrocephalus orientalis</i>	85.3 ± 3.06 mm (79–91 mm, n = 19)	74.1 ± 4.02 mm (66–78 mm, n = 17)	0.87 ± 0.03 (0.84–0.95, n = 17)	23.6 ± 0.79 mm (22.5–25.9 mm, n = 15)	29.0 ± 0.85 mm (28.0–30.9 mm, n = 16)
<i>Acrocephalus stentoreus</i>	88.5 ± 3.03 mm (79–96 mm, n = 69)	78.9 ± 3.87 mm (65–88 mm, n = 64)	0.89 ± 0.03 (0.82–0.95, n = 64)	25.3 ± 1.26 mm (22.3–28.9 mm, n = 62)	29.5 ± 1.25 mm (26.7–33.6 mm, n = 54)

wing length of presumed males was 62 mm and that of females was 56 mm. March-caught birds were significantly heavier than those caught in February (Wilcoxon Rank Sum Test: $W = 27371.5$, $p < 0.01$), with a mean weight of 9.0 ± 1.0 g compared with 8.2 ± 0.7 g in February. Over 90% of birds examined from 5 March onwards had already started to undergo a partial moult, usually involving body feathers, tertials and tail.

Six ringed Dusky Warblers were retrapped in successive seasons. At Baikka Beel one bird ringed in March 2011 was recaptured in December 2011, while four ringed in December 2011 were recaptured in late February 2013. One ringed at Tanguar in February 2012 was recaptured in March 2013.

Tickell's Leaf Warbler *Phylloscopus affinis*

A total of 32 were ringed. This species appeared to be more arboreal than Common Chiffchaff, often in the canopy of low trees, but at times descended into scrub. This study indicates that it is more regular in wetland scrub-forest than previously thought. Siddiqui *et al.* (2008) regard it as rare.

Yellow-vented Leaf Warbler *Phylloscopus cantator*

Regular winter visitor to evergreen forests in the north-east (Siddiqui *et al.* 2008) and not recorded in other habitats (to date). One in the canopy of a large, planted tree at Tanguar Haor on 23 February 2012 was a new locality record.

Rufous-necked Laughingthrush *Garrulax ruficollis*

Four were trapped and ringed from, apparently, a single flock which frequented the patch of swamp-forest and associated scrub at Baikka Beel. The species was first recorded at Hail Haor in January 2009 (PMT pers. obs.), and its first occurrence at Baikka Beel in February 2011 was presumably a response to habitat rehabilitation.

Eurasian Scaly Thrush *Zosterops dauma*

A single trapped at the edge of planted swamp-forest on 5 December 2011 at Baikka Beel was retrapped the following day when its weight had increased from 82.3 g to 89.4 g. Wing 141 mm, tail 97 mm, bill 29.5 mm, firmly place the bird within the expected range for *Z. dauma* rather than the longer-distance migrant *Z. aurea*, listed by Rasmussen & Anderton (2012) as hypothetical for South Asia. Additionally, the bird had 12 tail feathers whereas 14 rectrices are more typical for *Z. aurea*. Possibly the same individual had been seen at this site the previous winter (M. Khan & T. Khan pers. comm.). These were the first records of this species for any haor, and only the fifth (or sixth) country record of this rare winter visitor.

Siberian Rubythroat *Luscinia calliope*

On the basis that only seven birds were trapped, Siberian Rubythroat was less frequent than White-tailed Rubythroat *L. pectoralis* at all sites. This presumably was an outcome of focusing trapping effort on better-quality wetland sites with more reeds, more typical habitat for White-tailed Rubythroat. Siberian Rubythroat tends to be more frequent in drier scrub, such as on hillsides and in tea estates (Siddiqui *et al.* 2008, PMT pers. obs.), where it is widespread although uncommon.

White-tailed Rubythroat *Luscinia pectoralis*

Of a total of 21 birds caught, the eight males all showed the prominent white submoustachial streak of the Tibetan plateau race *L. p. tschebaiewi*. Some adult females resembled males, with a male face pattern in which the red on the throat was much reduced and the face pattern less strongly contrasted, with the lores and eye-patch being dark grey rather than black, these individuals also showing white in the base of the tail. Song was heard in early March.

Call-notes included a thin *se-ic*, a deep *tchuck* and a falling-tone whistle. All were similar to calls known for Siberian Rubythroat, but the whistle was, with experience, separable from the latter species, in being less strongly downward-inflected, and having a more plaintive quality.

A first-winter female ringed at Baikka Beel on 5 December 2011 was recaptured there on 24 and 25 February 2013. Prior to these records there were only three sightings (involving six birds) of this species, including the first from Tanguar Haor (Thompson & Johnson 2003, Thompson *et al.* 2014).

Bluethroat *Luscinia svecica*

Common winter visitor to wetlands throughout the country. One undoubted adult male, caught at Pashua on 13 February 2012, had a white central throat spot. It appears that nominate *svecica*, to which these birds appeared to belong, may have either a red or white spot in breeding plumage although red is much more frequent.

Firethroat *Luscinia pectardens*

The species is considered globally Near Threatened (BirdLife International 2014). A total of 11 birds (9 males and 2 females), 9 in 2012 and 2 in 2013, were caught at Pashua and Tanguar. The only previous country record was at Pashua in April 1992 (Thompson *et al.* 1994), with a second probable sighting at Tanguar in February 1996 (PMT pers. obs.). All birds seen and trapped were in native scrub forest close to the wetland margins.

Males were identified from the varying amounts of blue on the upperparts, and black tails with white flashes in both inner and outer webs of R2–R6 (with very little white, basally, on R6). Six of the nine males were first-winter birds, with a mixture of brown and black feathers on the upperparts, all (or most) greater coverts having pale tips. The remiges were edged brown rather than slaty-blue and the crown was brownish. Two presumed adult males were entirely slaty-blue above; including the crown, with no brown tipping on greater coverts and blackish lores. The plumage phenology seems to be undescribed but there is apparently a non-breeding plumage, since the first presumed adult male, caught on 14 February 2012, lacked any orange on the throat and additionally the cheeks were brownish. A second adult male, caught on 8 March 2013, was beginning to moult-in an orange throat and black on the sides of the head, but the breast and flanks remained uniformly buffy. The age of one further male, caught on 7 March 2013, was undetermined—the upperparts were all slaty-blue, lacking juvenile greater covert tipping, and only primaries 3 and 4, and all secondaries, were blue-edged; the remainder were brown-edged and additionally the lores were pale.

A series of photographs of a bird which apparently wintered in West Bengal, posted on Oriental Bird Images (orientalbirdimages.org) by Abhishek Das and Kshounish Sankar Ray, illustrates the transition from presumed non-breeding adult male plumage when first photographed on 11 March 2012, into partial breeding plumage by 1 April 2012. The sequence of body moult in this individual appeared different to our 8 March bird. The latter was already moulting-in orange on the throat, but showed a uniformly buffy breast. The West Bengal bird, clearly in a more advanced stage of body moult, had moulted-in deep, flame-orange feathers on the centre of the breast and had black on the sides of the breast but, unlike our 8 March bird, still showed a whitish throat.

Jerdon's Buschchat *Saxicola jerdoni*

A female caught at Baikka Beel on 25 February 2013 was only the sixth country record (Thompson *et al.* 2014). Wing 62 mm, tail 60 mm, bill 16.0 mm, tarsus 22.0 mm. The tail was strongly rounded, the outermost feathers being 11.3 mm shorter than the central pair.

Taiga Flycatcher *Ficedula albicilla*

Despite being a common winter visitor in Bangladesh, only 15 were trapped, mostly at Baikka Beel. It proved unaccountably scarce at both Pashua and Tanguar, although both sites supported scrub and trees that appeared to be suitable habitat.

Slaty-blue Flycatcher *Ficedula tricolor*

All four trapped birds were females: three at Pashua Haor during 11–16 February 2012 and one at Tanguar on 25 February 2012, caught in woody scrub. The weight of a Pashua bird recaptured three days later remained constant at 6.0 g. The presumed race was *F. t. cerviniventris*, which breeds in S Assam and Meghalaya above 2,700 m (Rasmussen & Anderton 2012) and winters on the plains of Bangladesh where it is rare—only two previous sightings, including the first record, a pair at Tanguar Haor (Thompson & Johnson 2003, Thompson *et al.* 2014).

Citrine Wagtail *Motacilla citreola*

Six birds caught included one undoubted breeding-plumage male (black-backed) *M. c. calcarata*.

Richard's Pipit *Anthus richardi*

Two individuals at Baikka Beel on 9–10 March 2011 were not aged, but were undergoing moult of tertials and some central tail feathers. One was also moulting the two innermost greater coverts. A third at Tanguar Haor on 22 February 2012, aged as a first-winter on the basis of three retained juvenile greater coverts, had not started pre-breeding moult. This winter visitor may be under-recorded among the generally commoner resident Paddyfield Pipit *A. rufulus*.

Olive-backed Pipit *Anthus hodgsoni*

Common winter visitor to open forest and village groves (Siddiqui *et al.* 2008); rare in wetlands due to the limited tree cover. Five trapped on the floor of open swamp woodland at Tanguar Haor during 22–23 February 2012 were identified as the long-distance migrant race *yunnanensis* on the basis of the pronounced shortfall of p5 against the wing-point.

Rosy Pipit *Anthus roseatus*

Regular winter visitor (Siddiqui *et al.* 2008). A total of ten were trapped, typically in the wet, grassy margins of waterbodies. Eight individuals examined at Baikka Beel during 9–10 March 2011 were undergoing pre-nuptial moult involving tertials. Four were also renewing central tail feathers and five had renewed one/two innermost greater coverts. Only one individual was in the early stages of body moult and none had yet assumed the pink underparts of breeding plumage.

Black-faced Bunting *Emberiza spodocephala*

A total of 15 were trapped in low scrub at Pashua Haor (eight males, six females, one sex unrecorded). All were considered to be race *E. s. sordida* due to the saturation of the yellow colour on the underparts and the greenish-tinged head in the males. This is a regular site for this localised winter visitor, known only from the haors of the north-east (Siddiqui *et al.* 2008). For reasons unknown it is very rarely recorded in Hail Haor (PMT pers. obs.).

DISCUSSION

Because the visits were focused primarily on ringing and training, relatively little time was spent in more general survey work, and observations (other than those obtained in the course of ringing) are fragmentary. Only a relatively small proportion of each site was covered. No systematic counts of waterbirds or other larger birds were attempted.

Implications of findings

The survey documented seven species not previously recorded in Bangladesh—Chestnut-crowned Bush Warbler, Aberrant Bush Warbler, Grey-sided Bush Warbler, David's Bush Warbler, Large-billed Reed Warbler, Oriental Reed Warbler and Sykes's Warbler. Furthermore Firethroat, previously known from only one or two records, listed by some authors (e.g. Grimmett *et al.* 2011) as a vagrant, was found in two successive winters, with eleven birds trapped in all, presumably indicating regular occurrence. These data and other species already documented in the systematic list indicate the continued richness and conservation importance of the north-east Bangladesh haors for species other than waterbirds. Because of the large size and relative inaccessibility of this area in the most densely populated country in Asia, other ornithological discoveries may be expected. Nonetheless the area has been hugely impacted by man, and its biodiversity has suffered greatly since Baker (1924) reported Rufous-rumped Grassbird *Graminicola bengalensis*, globally Near Threatened today, as 'very common in Cachar and Sylhet'. Although we have so far failed to find this species there is a strong possibility that a small population may remain—several were seen at Aila and Tanguar Haors in 1995, with further sightings from Tanguar Haor in 1996 and 2002 (Thompson & Johnson 2003), but since then the only records and photographs are from near Pashua Haor (Halder 2010, R. Halder pers. comm.). There are two historic records of another threatened floodplain passerine, the Vulnerable Black-breasted Parrotbill *Paradoxornis flavirostris*, from north-east Bangladesh in the nineteenth century (BirdLife International 2001). Later claims from south-east Bangladesh are unsubstantiated (BirdLife International 2001), and it is almost certainly extirpated from the country. The Vulnerable Marsh Babbler *Pellorneum palustre* was recorded in the nineteenth century but there is only one recent record from forest edge in 1989 (Thompson *et al.* 1993). Although other floodplain species, such as the Critically Endangered Bengal Florican *Eupodotis bengalensis* and Vulnerable Bristled Grassbird *Chaetornis striata*, have been lost there appear to be no historic records of either from the north-eastern haors (Siddiqui *et al.* 2008).

Because of its location in the north-east of South Asia it is likely that the study area hosts both South Asian and South-East Asian wintering populations of different bird taxa, and further work might better elucidate the winter ranges and relative numbers of these. For example Yellow Wagtail *Motacilla flava* is common at Hail Haor and Baikka Beel (Appendix 1) but we cannot offer any observations on the taxa present in Bangladesh as we neither caught nor observed any closely.

Aside from the great conservation importance for birds the sites support Golden Jackal *Canis aureus*, the globally Endangered Fishing Cat *Prionailurus viverrinus*, while the globally Endangered Ganges River Dolphin *Platanista gangetica* is still present in the main waterways.

Threats

Habitats at the three sites are threatened by the intensification of human use over the last two decades (EUH & PMT pers. obs.). In the dry season water levels in the haors have been reduced by pumping and diversion to expand agriculture, while the formerly extensive areas of swamp-forest in Pashua Haor have been cleared. In both Pashua and Tanguar Haors, reeds, swamp-forest and scrub continue to be cut for fuel. Most of the former seasonal grazing lands and marshlands adjacent to Baikka Beel have been converted to crops or aquaculture during the past five years. In addition burning has adversely affected the areas of *Ipomoea* during every dry season since 2010. Regeneration of this vegetation is limited due to the heavy grazing pressure.

Conservation measures at Baikka Beel, instituted since 2003 by a local community organisation and supported by a series of projects

funded by USAID, have proved spectacularly successful in reversing degradation, rehabilitating the wetland and replanting swamp-forest, and waterbird numbers are increasing. Even so, the Ministry of Land has recently threatened to lease out fishing rights in part of the wetland, reversing its designation as a sanctuary. This would adversely impact the progress made through community involvement. These factors, together with the loss of parts of Hail Haor where traditional fishing methods were previously used, due to conversion of the areas to agriculture and fish-farming, have increased the pressure on Baikka Beel sanctuary. In April 2013, after our most recent ornithological survey, unusually low water levels, natural fish mortality and agitation started by sections of the human population seeking to destroy the sanctuary, resulted in a mass fish-poaching operation in Baikka Beel itself, in which over 1,000 people participated (PMT pers. obs.).

Tanguar Haor already has formal protection supported by assignment of guards funded by the government, and by a conservation project implemented by IUCN Bangladesh, but swamp habitats have received less attention than fishery management. Pashua Haor has had no protection to date, leaving its remaining swamp vegetation vulnerable to further clearance. In 2013 a combination of sustainable management and conservation, following the approaches already adopted in Hail Haor and Baikka Beel, was proposed but could not be implemented due to existing leaseholder interests.

Recommendations

Based on the significance of swamp vegetation—reeds, bushes and trees—for specialised, mostly migratory, passerines revealed by this study, the threats observed to and wider ornithological significance of the sites revealed by waterbird monitoring, we make the following recommendations:

- (1) Greater emphasis should be placed on restoring and protecting bushy swamp vegetation, reeds, and swamp trees in all haors, in recognition of the value of these habitats for a range of mostly migrant passerines. Replacing existing bushy-thicket type vegetation with dense plantations of swamp-forest trees is, however, unacceptable as it may be detrimental to this avifauna. Instead, plantations of native trees should be established in more open areas that presently lack scrub and taller emergent vegetation.
- (2) Conservation initiatives and protection should be implemented at Pashua Haor, based on similar arrangements already made at Baikka Beel. Besides limiting human exploitation and disturbance, interventions should include maintaining dry season water levels through restrictions on extraction for irrigation, and enhancing and expanding the existing swamp vegetation.
- (3) The integrity of Baikka Beel sanctuary should be maintained, and extended by formally including in the sanctuary the bordering lands which lack proper protection at present.
- (4) Conservation of Tanguar Haor should include as a priority protection from grazing and the restoration of reed habitats, including the Giant Reed habitat that has been lost. Strict conservation areas need to be designated within the overall haor so that large areas remain free of human use, and exist alongside other zones where sustainable exploitation by the local communities is permitted.
- (5) Regular surveys using mist-nets and ringing should continue to be conducted by Bbc, in collaboration with government authorities, as a means of monitoring the avifauna of this habitat.

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REFERENCES

- Alam, A. B. M. S., Chowdhury, M. S. M. & Sobhan, I. (2012) *Biodiversity of Tanguar Haor: a Ramsar Site of Bangladesh*, 1. Wildlife. Dhaka: IUCN Bangladesh.
- Ali, S. & Ripley, S. D. (1983) *Handbook of the birds of India and Pakistan*. Compact edition. Delhi: Oxford University Press.
- Alström, P., Rasmussen, P. C., Olsson, U. & Sundberg, P. (2008) Species delimitation based on multiple criteria: the Spotted Bush Warbler *Bradypterus thoracicus* complex (Aves: Megaluridae). *Zool. J. Linn. Soc.* 154: 291–307.
- Baker, E. C. S. (1924) *The fauna of British India. Birds*, 2. Second Edition. London: Taylor and Francis.
- BirdLife International (2001) *Threatened birds of Asia: the BirdLife International Red Data Book*. Cambridge UK: BirdLife International.
- BirdLife International (2004) *Important Bird Areas of Asia: key sites for conservation*. Cambridge UK: BirdLife International.
- BirdLife International (2014) Species factsheet: *Lucinia pectardens*. Downloaded from <http://www.birdlife.org> on 30/08/2014.
- Grimmett, R., Inskipp, C. & Inskipp, T. (2011) *Birds of the Indian subcontinent*. Second edition. London: Christopher Helm.
- Halder, R. R. (2010) *A photographic guide to the birds of Bangladesh*. Dhaka: Baikka Teal Production.
- Haque, E. U., Dymond, N., Round, P. & Thompson, P. (2012) Ringing and recent ornithological exploration in Bangladesh. *BirdingASIA* 17: 78–79.
- Harvey, W. G. (1990) *Birds in Bangladesh*. Dhaka: University Press.
- Kennerley, P. R. & Pearson, D. J. (2010) *Reed and bush warblers*. London: Christopher Helm.
- Khan, M. A. (1997) Ecology of floodplains in the northeastern region of Bangladesh. Pp.153–172 in Tsai C.-F. & M. Y. Ali, eds. *Openwater fisheries of Bangladesh*. Dhaka: University Press Ltd.
- Rashid, H. (1967) *Systematic list of the birds of East Pakistan*. Publication no. 20. Dacca: The Asiatic Society of Pakistan.
- Rasmussen, P. C. & Anderton, J. C. (2012) *Birds of South Asia: the Ripley guide*. Second edition. Washington DC, Michigan & Barcelona: Smithsonian Institution, Michigan State University & Lynx Edicions.
- Round, P. D. & Loskot, V. (1995) A reappraisal of the taxonomy of the Spotted Bush-Warbler *Bradypterus thoracicus*. *Forktail* 10: 159–172.
- Round, P. D. & Baral, H. S. (2013) A record of David's Bush Warbler *Bradypterus davidi* in Nepal. *BirdingASIA* 20: 107–109.
- Round, P. D., Hansson, B., Pearson, D. J., Kennerley, P. R. & Bensch, S. (2007) Lost and found: the enigmatic large-billed reed warbler *Acrocephalus orinus* rediscovered after 139 years. *J. Avian Biol.* 38: 133–138.
- Siddiqui, K. U., Islam, M. A., Kabir, S. M. H., Ahmad, M., Ahmed, A. T. A., Rahman, A. K. A., Haque, E. U., Ahmed, Z. U., Begum, Z. N. T., Hassan, M. A., Khondker, M. & Rahman, M. M., eds. (2008) *Encyclopedia of flora and fauna of Bangladesh*, 26. Birds. Dhaka: Asiatic Society of Bangladesh.
- Sobhan, I., Alam, A. B. M. S. & Chowdhury, M. S. M. (2012) *Biodiversity of Tanguar Haor: a Ramsar Site of Bangladesh*, 2. Flora. Dhaka: IUCN Bangladesh.
- Svensson, L. (1992) *Identification guide to European passerines*. Fourth edition. Thetford: British Trust for Ornithology.

- Svensson, L., Prys-Jones, R., Rasmussen, P. C. & Olsson, U. (2008) Discovery of ten new specimens of large-billed reed warbler *Acrocephalus orinus*, and new insights into its distributional range. *J. Avian Biol.* 39: 605–610.
- Svensson, L., Prys-Jones, R., Rasmussen, P. C. & Olsson, U. (2010) The identification and distribution of the enigmatic Large-billed Reed Warbler *Acrocephalus orinus*. *Ibis* 152: 323–334.
- Thompson, P. M., Harvey, W. G., Johnson, D. L., Millin, D. J., Rashid, S. M. A., Scott, D. A., Stanford, C. & Woolner, J. D. (1993) Recent notable bird records from Bangladesh. *Forktail* 9: 13–44.
- Thompson, P. M. & Johnson, D. L. (2003) Further notable bird records from Bangladesh. *Forktail* 19: 85–102.
- Thompson, P. M., Chowdhury, S. U., Haque, E. U., Khan, M. M. H. & Halder, R. (2014) Notable bird records from Bangladesh from July 2002 to July 2013. *Forktail* 30: 50–65
- Williamson, K. (1968) *Identification for ringers I: The genera Cettia, Locustella, Acrocephalus and Hippolais*. Tring UK: British Trust for Ornithology.

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Appendix 1.

List of bird species recorded at Hail Haor (including Baikka Beel), Pashua Haor and Tanguar Haor from 1986 to March 2013.

Note: Baikka Beel lies entirely within Hail Haor, therefore records and status from Baikka Beel are included in Hail Haor. Key: the numbers 1–5 indicate the number of times a species has been seen at each location (a flock on one day counts as one record). When a species has been seen > 5 times since 1986: r = rare, > 5 sightings but rarely recorded (< 1 per year); uc = uncommon, seen on several visits per year; c = common, several individuals seen on every visit. New site records during the present study are shown in bold.

Species	Hail Haor	(Baikka Beel)	Pashua Haor	Tanguar Haor	Species	Hail Haor	(Baikka Beel)	Pashua Haor	Tanguar Haor
Fulvous Whistling-duck <i>Dendrocygna bicalar</i>	c	c	c	c	Indian Pond Heron <i>Ardeala grayii</i>	c	c	c	c
Lesser Whistling-duck <i>Dendrocygna jovanica</i>	c	c	c	c	Chinese Pond Heron <i>Ardeala bocchus</i>	2	1	1	
Greylag Goose <i>Anser anser</i>	2	2		uc	Cattle Egret <i>Bubulcus ibis</i>	c	c	c	c
Bar-headed Goose <i>Anser indicus</i>	r	2		r	Grey Heron <i>Ardeo cinereo</i>	c	c	c	c
Comb Duck <i>Sorkidiornis melanos</i>	1	1			Purple Heron <i>Ardea purpurea</i>	uc	uc	uc	uc
Ruddy Shelduck <i>Todorno ferrugineo</i>	r	4	1	r	Great Egret <i>Cosmeradius albus</i>	c	c	c	c
Common Shelduck <i>Todorno todorno</i>			1		Intermediate Egret <i>Mesophayx intermedio</i>	c	c	uc	uc
Mandarin Duck <i>Aix golericuloto</i>			1		Little Egret <i>Egretta gorzetto</i>	c	c	c	uc
Cotton Pygmy Goose <i>Nettopus coromandelionus</i>	uc	uc	r	uc	Great White Pelican <i>Peleconus onocrotalus</i>			1	
Gadwall <i>Anas strepero</i>	uc	uc	c	c	Little Cormorant <i>Phalacrocorax niger</i>	c	c	c	c
Falcated Duck <i>Anas falcata</i>	3	2		uc	Great Cormorant <i>Phalacrocorax corba</i>	uc	uc	uc	uc
Eurasian Wigeon <i>Anas penelope</i>	r	r	uc	c	Oriental Darter <i>Anhinga melonogaster</i>	uc	uc	uc	r
Mallard <i>Anas platyrhynchos</i>			r	uc	Common Kestrel <i>Falco tinnunculus</i>	r		2	r
Western Spot-billed Duck <i>Anas paucilarhyncha</i>	r		uc	uc	Red-necked Falcon <i>Falca chicquera</i>			1	
Northern Shoveler <i>Anas clypeata</i>	uc	uc	c	c	Eurasian Hobby <i>Falca subbutea</i>	2			
Northern Pintail <i>Anas acuta</i>	c	c	c	c	Peregrine Falcon <i>Falco peregrinus</i>			2	r
Garganey <i>Anas querquedula</i>	c	c	c	c	Osprey <i>Pandion haliaetus</i>	r	4	2	1
Baikal Teal <i>Anas farmasa</i>				4	Black-winged Kite <i>Elanus caeruleus</i>	r	2	r	r
Common Teal <i>Anas crecca</i>	c	c	c	c	Black Kite <i>Milvus migrans</i>	c	c	c	c
Red-crested Pochard <i>Netta rufina</i>	1		c	c	Brahminy Kite <i>Haliastur indus</i>	c	c	c	c
Common Pochard <i>Aythya ferina</i>	r	3	c	c	Pallas's Fish Eagle <i>Haliaeetus leucoryphus</i>	uc	uc	uc	uc
Ferruginous Duck <i>Aythya nyra</i>	uc	uc	c	c	Grey-headed Fish Eagle <i>Ichthyophaga ichthyoetus</i>	3	1	2	1
Baer's Pochard <i>Aythya baeri</i>	2	1	5	r	White-rumped Vulture <i>Gyps bengolensis</i>	uc		uc	r
Tufted Duck <i>Aythya fuligula</i>	r	5	c	c	Slender-billed Vulture <i>Gyps tenuirostris</i>			2	1
Greater Scaup <i>Aythya morilo</i>			1	2	Himalayan Vulture <i>Gyps himalayensis</i>	2			
Little Grebe <i>Tochyboptus ruficollis</i>	uc	uc	r	c	Griffon Vulture <i>Gyps fulvus</i>	1			
Red-necked Grebe <i>Podiceps grisegena</i>				1	Crested Serpent Eagle <i>Spilornis cheela</i>	r			
Great Crested Grebe <i>Podiceps cristatus</i>			uc	c	Western Marsh Harrier <i>Circus oeruginasus</i>	c	c	c	uc
Black-necked Grebe <i>Podiceps nigricollis</i>				1	Eastern Marsh Harrier <i>Circus spilanatus</i>	c	c	r	uc
Asian Openbill <i>Anostamus ascitans</i>	c	uc	uc		Northern Harrier <i>Circus cyoneus</i>	5	1		1
Black Stork <i>Ciconia nigro</i>			1		Pallid Harrier <i>Circus mocrourus</i>				1
Black-headed Ibis <i>Threskiarnis melanacephalus</i>	uc	uc	r		Pied Harrier <i>Circus melanaleucas</i>	c	uc	uc	r
Glossy Ibis <i>Plegadis falcinellus</i>	r	r		r	Shikra <i>Accipiter bodius</i>	1		1	
Eurasian Spoonbill <i>Platalea leucorodia</i>			1		Eurasian Sparrowhawk <i>Accipiter nisus</i>	r			
Great Bittern <i>Botaurus stellaris</i>	1				Common Buzzard <i>Buteo butea</i>	1			
Yellow Bittern <i>Ixobrychus sinensis</i>	r	r	r		Indian Spotted Eagle <i>Aquila hostoto</i>	3	2		r
Cinnamon Bittern <i>Ixobrychus cinnamomeus</i>	r	2	r	r	Greater Spotted Eagle <i>Aquila clongu</i>	uc	uc		r
Black Bittern <i>Ixobrychus flavicollis</i>	3	2		1	Steppe Eagle <i>Aquila nipolensis</i>	r	r	r	1
Black-crowned Night Heron <i>Nycticorax nycticorax</i>	3	1	uc	r	Eastern Imperial Eagle <i>Aquila heliaca</i>	2	1		
Striated Heron <i>Butorides strioto</i>			r	uc	Slaty-breasted Rail <i>Gallirallus striotus</i>	2	1	2	r

Species	Hail Haor	(Baikka Beel)	Pashua Haor	Tanguar Haor	Species	Hail Haor	(Baikka Beel)	Pashua Haor	Tanguar Haor
Water Rail <i>Rallus aquoticus</i>	2	1	3	r	Indian Roller <i>Coracias benghalensis</i>	uc		1	
White-breasted Waterhen <i>Amaurornis phaenicurus</i>	2	2	r	r	Stark-billed Kingfisher <i>Pelagopsis copensis</i>	1			
Baillon's Crane <i>Porzana pusilla</i>	1		2	r	White-throated Kingfisher <i>Halcyon smyrnensis</i>	c	c	r	c
Ruddy-breasted Crane <i>Parzana fusca</i>	r	r	uc	r	Blyth's Kingfisher <i>Alcedo hercules</i>	1			
Watercock <i>Gallinix cinerea</i>	r	3	r		Common Kingfisher <i>Alceda atthis</i>	c	c	c	c
Purple Swampphen <i>Parphyria porphyrio</i>	c	c	c	c	Pied Kingfisher <i>Ceryle rudis</i>	uc	uc	c	uc
Common Moorhen <i>Gallinula chloropus</i>	c	c	c	c	Green Bee-eater <i>Merops orientalis</i>	uc	uc	uc	uc
Camman Caat <i>Fulica atra</i>	uc	uc	c	c	Blue-tailed Bee-eater <i>Merops philippinus</i>	uc	uc		r
Black-winged Stilt <i>Himantopus himantopus</i>	c	c	c	c	Eurasian Haapae <i>Upupa epops</i>	uc	r	2	
Pied Avacet <i>Recurvirostra avasetta</i>				1	Eurasian Wryneck <i>Jynx torquilla</i>	r	r	1	2
Northern Lapwing <i>Vonellus vonellus</i>	2	2	3	r	Fulvous-breasted Woodpecker <i>Dendrocopos mocei</i>	4	3		1
River Lapwing <i>Vonellus duvoucelii</i>				1	Small Minivet <i>Pericacatus cinnamomeus</i>				1
Grey-headed Lapwing <i>Vanellus cinereus</i>	c	c	r	uc	Brown Shrike <i>Lanius cristatus</i>	c	uc	r	uc
Red-wattled Lapwing <i>Vanellus indicus</i>	r				Long-tailed Shrike <i>Lanius schach</i>	c	c		1
Pacific Golden Plover <i>Pluvialis fulva</i>	c	c	1	r	Grey-backed Shrike <i>Lanius tephronotus</i>	3	3	1	r
Grey Plover <i>Pluvialis squatarola</i>	1				Eurasian Golden Oriole <i>Oriolus oriolus</i>	1	1		
Long-billed Plover <i>Charadrius plocidus</i>	1				Black-naped Oriole <i>Oriolus chinensis</i>	1	1		1
Little Ringed Plover <i>Chorodrius dubius</i>	c	c	r	r	Black-hooded Oriole <i>Oriolus xanthornus</i>	3	3	uc	uc
Kentish Plover <i>Choradrius alexandrinus</i>	r		r	r	Slender-billed Oriole <i>Oriolus tenuirostris</i>				1
Lesser Sand Plover <i>Charadrius mangalus</i>	r	1	1	1	Black Treepie <i>Dicrurus macracercus</i>	c	c	c	c
Greater Painted-snipe <i>Raстрatula benghalensis</i>	r	2		uc	Rufous Treepie <i>Dendrocitta vagabunda</i>	c	r		
Pheasant-tailed Jacana <i>Hydraphasianus chirurgus</i>	c	c	2	c	Hause Crow <i>Corvus splendens</i>			c	c
Bronze-winged Jacana <i>Metapidius indicus</i>	c	c		1	Jungle Crow <i>Corvus leuallanti</i>	c	uc	c	c
Jack Snipe <i>Lymnacropteryx minimus</i>	r				Sand Martin <i>Riparia riparia</i>	c	uc		c
Pintail Snipe <i>Gallinago stenura</i>	uc	r	3	r	Plain Martin <i>Riparia paludicola</i>	r		1	1
Swinhoe's Snipe <i>Gallinago megala</i>	1				Pale Martin <i>Riparia diluta</i>			1	
Camman Snipe <i>Gallinago gallinago</i>	c	uc	c	r	Barn Swallow <i>Hirunda rustica</i>	c	c	c	c
Black-tailed Godwit <i>Limosa limosa</i>	uc	uc	r	uc	Red-rumped Swallow <i>Hirunda daurica</i>	uc	r		
Bar-tailed Godwit <i>Limosa lapponica</i>	1				Asian House Martin <i>Delichon dasypus</i>	1			1
Spotted Redshank <i>Tringa erythropus</i>	c	c	r	r	Bengal Bush Lark <i>Mirafra assamica</i>	c	r	r	
Common Redshank <i>Tringa tatanus</i>	r		1	1	Oriental Skylark <i>Alauda gulgula</i>	uc		2	
Marsh Sandpiper <i>Tringa stagnatilis</i>	c	c	r	r	Zitting Cisticola <i>Cisticola juncidis</i>	c	1	r	r
Camman Greenshank <i>Tringa nebularia</i>	uc	3	r	r	Red-vented Bulbul <i>Pycnanotus cafer</i>	uc	uc	r	r
Green Sandpiper <i>Tringa ochrapus</i>	uc	r	r	r	Common Tailorbird <i>Orthotomus sutorius</i>	r	r		
Wood Sandpiper <i>Tringa glareala</i>	c	uc	r	uc	Striated Grassbird <i>Megalurus palustris</i>	c	c	c	c
Camman Sandpiper <i>Actitis hypoleucos</i>	r	r	uc	r	Rufous-rumped Grassbird <i>Graminicala bengalensis</i>				3
Little Stint <i>Calidris minuta</i>	r	r	1		Chestnut-crowned Bush Warbler <i>Cettia major</i>			1	
Temminck's Stint <i>Calidris temminckii</i>	uc	uc	2		Aberrant Bush Warbler <i>Cettia flavalivacea</i>			5	1
Curlew Sandpiper <i>Calidris ferruginea</i>	r	2			Grey-sided Bush Warbler <i>Cettia brunniifrons</i>				1
Ruff <i>Philamachus pugnax</i>	c	c	uc	uc	Spotted Bush Warbler <i>Bradypterus tharacicus</i>	r	r	r	r
Oriental Pratincole <i>Glareala maldivarum</i>	r		1	uc	David's Bush Warbler <i>Bradypterus davidi</i>	r	r	r	2
Small Pratincole <i>Glareola lactea</i>	2	1			Lanceolated Warbler <i>Locustella lanceolata</i>	3	1	2	3
Heuglin's Gull <i>Larus heuglini</i>				2	Common Grasshopper Warbler <i>Lacustella naevia</i>				1
Pallas's Gull <i>Larus ichthyaetus</i>			1	r	Pallas's Grasshopper Warbler <i>Lacustella certhiala</i>	r	r	uc	uc
Brown-headed Gull <i>Larus brunnecephalus</i>	3	2	r	c	Black-browed Reed Warbler <i>Acrocephalus bistrigiceps</i>	r	3	r	uc
Black-headed Gull <i>Larus ridibundus</i>	r	r	c	uc	Paddyfield Warbler <i>Acrocephalus agricola</i>	c	uc	c	c
Gull-billed Tern <i>Gelachelidon nilotica</i>			1		Blyth's Reed Warbler <i>Acrocephalus dumetorum</i>	c	c	c	c
River Tern <i>Sterna aurantia</i>			1	2	Oriental Reed Warbler <i>Acrocephalus orientalis</i>	r	r		r
Camman Tern <i>Sterna hirunda</i>	1				Large-billed Reed Warbler <i>Acrocephalus arinus</i>	1	1		
Whiskered Tern <i>Chlidanius hybridus</i>	uc	uc	uc	uc	Clamorous Reed Warbler <i>Acrocephalus stentoreus</i>	c	c	c	c
Rack Pigeon <i>Calumba livia</i>	c	r	r	r	Thick-billed Warbler <i>Acrocephalus aedon</i>	r	r	1	1
Oriental Turtle Dove <i>Streptopelia orientalis</i>	r				Syke's Warbler <i>Iduna rama</i>	1	1		
Spotted Dove <i>Streptopelia chinensis</i>	c	c	c	c	Common Chiffchaff <i>Phyllascopus collybita</i>	4	3	1	uc
Red Collared Dove <i>Streptopelia tranquebarica</i>	r	1			Dusky Warbler <i>Phyllascopus fuscatus</i>	c	c	c	c
Eurasian Collared Dove <i>Streptopelia decaacta</i>	c	uc	r	c	Smoky Warbler <i>Phyllascopus fulgiventis</i>			1	
Rose-ringed Parakeet <i>Psittacula krameri</i>	uc	1		r	Tickell's Leaf Warbler <i>Phyllascopus affinis</i>	r	r	uc	uc
Pied Cuckoo <i>Clamator jacobinus</i>	r	3	1	r	Inornate Warbler <i>Phyllascopus inornatus</i>	r	r		1
Common Hawk Cuckoo <i>Hieracaccyx varius</i>	r		1	r	Greenish Warbler <i>Phyllascopus trachiloides</i>	1	1	2	
Indian Cuckoo <i>Cuculus micropterus</i>	uc	1			Yellow-vented Warbler <i>Phyllascopus cantator</i>				1
Lesser Cuckoo <i>Cuculus paliacephalus</i>	1				Whistler's Warbler <i>Seicercus whistleri</i>	1	1		
Plaintive Cuckoo <i>Cacomantis merulinus</i>	c	c	2	uc	Lesser Whitethroat <i>Sylvia curruca</i>	1			
Greater Coucal <i>Centropus sinensis</i>			2	1	Striated Babbler <i>Turdoides earlei</i>	uc	uc		
Lesser Coucal <i>Centropus bengalensis</i>	3	3		1	Rufous-necked Laughingthrush <i>Garrulax ruficollis</i>	r	r		
Barn Owl <i>Tyto alba</i>				1	Common Myna <i>Acridotheres tristis</i>	c	c	c	uc
Spotted Owllet <i>Athene brama</i>	uc	r			Jungle Myna <i>Acridotheres fuscus</i>	uc	uc	1	r
Brown Hawk Owl <i>Ninox scutulata</i>	2	2			Chestnut-tailed Starling <i>Sturnus malabaricus</i>	r	r	1	uc
Large-tailed Nightjar <i>Caprimulgus macrurus</i>	r	r			Common Starling <i>Sturnus vulgaris</i>	1			
Himalayan Swiftlet <i>Callacalia brevirostris</i>	2	2			Asian Pied Starling <i>Sturnus cantra</i>	c	c	c	c
Asian Palm Swift <i>Cypsiurus balasiensis</i>	uc	4	1		Eurasian Scaly Thrush <i>Zoothera dauma</i>	2	2		
House Swift <i>Apus nipalensis</i>	1	1			Siberian Rubythroat <i>Luscinia calliope</i>	r	r		1

Species	Hail Haor	(Baikka Beel)	Pashua Haor	Tanguar Haor	Species	Hail Haor	(Baikka Beel)	Pashua Haor	Tanguar Haor
White-tailed Rubythroat <i>Luscinia pectoralis</i>	r	r	r	r	Scaly-breasted Munia <i>Lanchura punctulata</i>	uc			
Bluethroat <i>Luscinia svecica</i>	uc	r	uc	uc	Chestnut Munia <i>Lonchura otricapilla</i>	uc		2	
Firethroat <i>Luscinia pectoralis</i>			r	r	White Wagtail <i>Motacilla alba</i>	c	uc	c	c
Indian Blue Robin <i>Luscinia brunnea</i>				1	White-browed Wagtail <i>Motacilla maderaspatensis</i>	1			
Oriental Magpie Robin <i>Capsychus sauloris</i>	uc	r	uc	uc	Citrine Wagtail <i>Motacilla citreola</i>	c	c	1	uc
Black Redstart <i>Phoenicurus achrurus</i>	2	1			Yellow Wagtail <i>Motacilla flava</i>	c	c	uc	r
White-tailed Robin <i>Cinclidium leucurum</i>				1	Grey Wagtail <i>Motacilla cinerea</i>	1			
Common Stonechat <i>Soxicalo tarquato</i>	c	c	c	uc	Richard's Pipit <i>Anthus richardi</i>	uc	r	1	2
Jerdon's Bushchat <i>Saxicola jerdani</i>	1	1			Paddyfield Pipit <i>Anthus rufulus</i>	c	uc	c	uc
Rufous-gorgeted Flycatcher <i>Ficedula straphiota</i>				1	Tawny Pipit <i>Anthus compestris</i>	1			
Taiga Flycatcher <i>Ficedula olbiccillo</i>	uc	uc		3	Olive-backed Pipit <i>Anthus hodgsoni</i>	1			5
Slaty-blue Flycatcher <i>Ficedula tricolor</i>			3	2	Rosy Pipit <i>Anthus raseotus</i>	c	c	c	uc
Verditer Flycatcher <i>Eumyias thalassino</i>	1	1			Common Rosefinch <i>Corpadocus erythrinus</i>	1			
Purple-rumped Sunbird <i>Nectarinio zeylanico</i>	r				Chestnut-eared Bunting <i>Emberizo fucato</i>	r			
Purple Sunbird <i>Nectarinia asiatica</i>	1				Little Bunting <i>Emberizo pusilla</i>	1			
House Sparrow <i>Passer domesticus</i>	c	uc	uc	uc	Yellow-breasted Bunting <i>Emberizo aureala</i>	uc	r	r	
Black-breasted Weaver <i>Placeus bengholensis</i>	uc				Black-faced Bunting <i>Emberizo spodacepholo</i>	r	r	uc	uc
Streaked Weaver <i>Placeus manyar</i>	r								
Baya Weaver <i>Placeus philippinus</i>	c	c	1	c	Number of species recorded	217	(169)	161	176
Red Avadavat <i>Amandova amandova</i>				1	Species added during this study	11	(11)	12	23
White-throated Munia <i>Lonchura molabarica</i>	r								

Sources: Site lists compiled by PMT include his records since 1986, records contributed by all authors and participants (including records from visits/surveys outside the present study) and records from other observers, including Anisuzzaman Khan, William Collis, Ronald Halder, David Johnson, David Millin, Munir Ahmed, S. M. A. Rashid, Derek Scott, Tania Khan and John Woolner.

Appendix 2.

Wing lengths and weights of bird trapped and ringed at Baikka Beel, Pashua Haor and Tanguar Haor, 2011–2013.

Species	Baikka Beel			Pashua	Tanguar	Total	Sex	Wing length (mm)	Weight (g)
	Mar 2011	Dec 2011	Feb 2013	Feb 2012	Feb 2012				
Yellow Bittern <i>Ixobrychus sinensis</i>			1			1	m	139	86
Shikra <i>Accipiter badius</i>				1		1	m	187	140.9
Ruddy-breasted Crake <i>Parzono fusco</i>				1		1		100	78.2
White-breasted Waterhen <i>Amaurornis phaenicurus</i>					1	1		167	n/a
Greater Painted-snipe <i>Raistratula benghalensis</i>					15	15	m	131.6 ± 2.50 (128–136, n = 8)	126.4 ± 6.73, n = 7
							f	141.6 ± 2.76 (138–145, n = 7)	162.2 ± 11.18, n = 6
Wood Sandpiper <i>Tringa glareola</i>		1				2		123, 124	57.8, 57.6
Spotted Dove <i>Streptopelia chinensis</i>	1	2				3		138, 140, 146	129.6, 127.2, 138.0
Plaintive Cuckoo <i>Cacomantis merulinus</i>	3	1	5	4	1	14		113.8 ± 3.89 (104–122, n = 14)	30.1 ± 2.11, n = 14
Greater Coucal <i>Centropus sinensis</i>				1		1		n/a	n/a
Lesser Coucal <i>Centropus bengolensis</i>					1	1		157	93.8
Brown Hawk Owl <i>Ninox scutulata</i>		1				1		213	252.4
White-throated Kingfisher <i>Halcyon smyrnensis</i>	1					1		120	81.3
Common Kingfisher <i>Alcedo atthis</i>	3	5	2	4	4	18	m	71.4 ± 1.52 (69–73, n = 5)	25.0 ± 1.84, n = 5;
							f	72.6 ± 1.57 (71–75, n = 11)	26.0 ± 2.90, n = 12
Green Bee-eater <i>Meraps orientalis</i>		1				1		92	17.5
Eurasian Wryneck <i>Jynx torquilla</i>	2		1	1		4		85, 87, 88, 89	32.3, 36.6, 33.6, 36.7
Fulvous-breasted Woodpecker <i>Dendrocopos macei</i>	1					1	m	106	47.8
Brown Shrike <i>Lanius cristatus</i>	2	1				3		85, 86, 88	28.0, 29.6, 29.4
Long-tailed Shrike <i>Lanius schach</i>	5	2			3	10		97.7 ± 3.61 (92–102, n = 9)	42.2 ± 3.54, n = 9
Grey-backed Shrike <i>Lanius tephronatus</i>			1			1		98	41
Black-hooded Oriole <i>Oriolus xanthamys</i>				3	2	5		128, 132, 132, 133, n/a	46.6, 54.2, 55.2, 56.8, n/a
Black Drongo <i>Dicrurus mocrocerus</i>	9	5	2		1	17		146.4 ± 4.05 (140–152, n = 16)	53.8 ± 5.47, n = 15
House Crow <i>Corvus splendens</i>					1	1		280	306.8
Barn Swallow <i>Hirunda rustica</i>	1					1		n/a	17.4
Red-vented Bulbul <i>Pycnonotus cofer</i>	1	6	6	2		15		101.2 ± 3.2 (95–106, n = 14)	39.8 ± 3.80, n = 15
Common Tailorbird <i>Orthotomus sutorius</i>	1	1	3			5		46.4 ± 1.52 (44–48, n = 5)	7.5 ± 0.27, n = 5
Striated Grassbird <i>Megolurus polustris</i>	4	9	6	16	22	10	m	97.9 ± 2.37 (92–102, n = 37);	46.9 ± 3.27, n = 36
							f	83.9 ± 2.20 (80–88, n = 30)	32.0 ± 2.44, n = 27
Chestnut-crowned Bush Warbler <i>Cettia major</i>				1		1		62	9.7
Aberrant Bush Warbler <i>Cettia flavolivacea</i>				5		6		54.0 ± 2.00 (51–57, n = 6)	8.1 ± 0.63, n = 5
Grey-sided Bush Warbler <i>Cettia brunnifrons</i>					1	1		48	7.7
Spotted Bush Warbler <i>Brodypterus tharacicus</i>		1	3	4	5	13		55.0 ± 0.78 (54–56, n = 13)	11.11 ± 0.86, n = 11
David's Bush Warbler <i>Brodypterus davidi</i>		4	1	5	2	12		51.9 ± 1.16 (50–54, n = 12)	9.7 ± 0.51, n = 11
Pallas's Grasshopper Warbler <i>Locustella certhiala</i>	7	4	2	4	6	27		64.9 ± 1.82 (61–69, n = 27)	14.6 ± 0.97, n = 25
Black-browed Reed Warbler <i>Acrocephalus bistrigiceps</i>		2			23	26		55.5 ± 1.92 (52–60, n = 26)	8.3 ± 0.62, n = 25
Paddyfield Warbler <i>Acrocephalus agricalo</i>		2	5	6	86	143		58.5 ± 1.62 (55–62, n = 143)	8.8 ± 0.60, n = 142
Blyth's Reed Warbler <i>Acrocephalus dumetorum</i>	31	39	20	57	73	286		61.6 ± 1.62 (57–66, n = 286)	10.4 ± 2.79, n = 278
Oriental Reed Warbler <i>Acrocephalus orientalis</i>		3	2		10	19		85.3 ± 3.06 (79–91, n = 19)	24.6 ± 2.46, n = 19

Species	Baikka Beel			Pashua	Tanguar		Total	Sex	Wing length (mm)	Weight (g)
	Mar 2011	Dec 2011	Feb 2013	Feb 2012	Feb 2012	Mar 2013				
Large-billed Reed Warbler <i>Acrocephalus arinus</i>		1					1		62	10.9
Clamorous Reed Warbler <i>Acrocephalus stentoreus</i>	18	1	4	11	22	13	69		88.5 ± 3.03 (79–96, n = 69)	26.7 ± 7.10, n = 66
Thick-billed Warbler <i>Acrocephalus aedan</i>		3	2			1	6		80.8 ± 2.80 (75–83, n = 6)	23.4 ± 2.38 n = 6
Sykes's Warbler <i>Iduno ramo</i>	1						1		61	9.2
Common Chiffchaff <i>Phylloscopus collybita</i>	1		2		10	3	16		58.1 ± 2.45 (55–64, n = 16)	6.9 ± 0.58, n = 16
Dusky Warbler <i>Phyllascopus fuscotus</i>	39	68	42	103	74	60	386		60.0 ± 3.25 (54–68; n = 385)	8.5 ± 0.84, n = 369
Tickell's Leaf Warbler <i>Phyllascopus affinis</i>	1		3	13	8	7	32		55.4 ± 2.11 (53–61, n = 26)	6.4 ± 0.06, n = 26
Inornate Warbler <i>Phyllascopus inornatus</i>		3					3		53, 54, 56	5.4, 5.4, 5.7
Greenish Warbler <i>Phyllascopus trochiloides</i> nom.		1		1			2		55, 57	7.1, 7.1
Striated Babbler <i>Turdoides eorlei</i>	3	1					4		91, 94, 94, 94	47.7, 39.8, 47.9, n/a
Rufous-necked Laughingthrush <i>Gorrulox ruficallis</i>	3		1				4		99, 100, 100, 102	54.9, 55.8, 56.1, 53.3
Jungle Myna <i>Acridotheres fuscus</i>		1					1		124	82.4
Chestnut-tailed Starling <i>Sturnus moloboricus</i>			1				1		99	35.7
Asian Pied Starling <i>Sturnus contro</i>		14	12	34	13	5	78		119.8 ± 3.14 (113–126, n = 78)	78.9 ± 6.73, n = 74
Eurasian Scaly Thrush <i>Zoothera dauma</i>		1					1		141	82.3
Siberian Rubythroat <i>Luscinia collipe</i>	1	3	2		1		7	m	75, 75, 78	18.8, 21.6, 21.3
								f	73, 74, 75, 76	19.4, 20.0, 19.3, 20.0
White-tailed Rubythroat <i>Luscinia pectoralis</i>		9	6	3	3		21	m	77.5 ± 3.21 (72–82, n = 8)	17.9 ± 6.20, n = 8
								f	72.5 ± 1.71 (70–75, n = 13)	18.1 ± 0.97, n = 13
Bluethroat <i>Luscinia svecico</i>			1	4	15	3	23	m	74.2 ± 2.97 (67–80, n = 19)	16.5 ± 1.43, n = 19
								f	71, 74, 75, 86	15.7, 16.1, 15.3, 15.0
Firethroat <i>Luscinia pectoralens</i>				7	2	2	11	m	72.1 ± 1.54 (70–75, n = 9)	15.1 ± 0.75, n = 9
								f	67, 69	15.1, 13.9
Oriental Magpie Robin <i>Copsychus saularis</i>		1	3	1			5	m	96, 98, 99	38.7, 36.1, 36.2
								f	92, 93	33.3, 35.7
Common Stonechat <i>Soxycolo torquata</i>					2		2	f	72	22.1
								m	76	22.8
Jerdon's Bushchat <i>Saxicala jerdoni</i>			1				1	f	62	n/a
Taiga Flycatcher <i>Ficedulo albicillo</i>	4	6	2		2	1	15		68.9 ± 1.57 (66–71, n = 15)	9.8 ± 0.61, n = 15
Slaty-blue Flycatcher <i>Ficedulo tricolor</i>				3	1		4	f	57, 57, 59, 60	6.0, 6.3, 6.5, 6.5
Baya Weaver <i>Placeus philippinus</i>	15				9	100	124		75.4 ± 1.88 (70–80, n = 124)	27.3 ± 1.98, n = 122
Citrine Wagtail <i>Motacilla citreala</i>	1					5	6	m	84, 84, 87, 91	n/a, 18.1, 19.4, 18.1, 19.5
								f	82, 85	17.3, 18.2
Richard's Pipit <i>Anthus richardi</i>	2				1		3		90, 92, 94	25.4, 26.7, 28.2
Olive-backed Pipit <i>Anthus hadgsoni</i>					5		5		83.7 ± 2.49 (81–87)	21 ± 0.94
Rosy Pipit <i>Anthus roseotus</i>	8				1	1	10		87.8 ± 2.04 (84–91, n = 10)	20.7 ± 1.09, n = 10
Black-faced Bunting <i>Emberiza spodocephala</i>				10	5		15	m	74.5 ± 2.39 (71–78, n = 8)	17.7 ± 0.92, n = 7
								f	69.0 ± 1.67 (68–72, n = 6)	16.5 ± 1.24, n = 5
	169	203	142	305	428	335	1,582			